

The Concept and Effectiveness of Teaching Practices Using OPPA

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This study examines academic trends in learning and assessment theories based on the OPPA (One Page Portfolio Assessment), which was developed in 2002. The study also clarifies the theoretical framework, teaching practices, application, and effectiveness of the OPPA. The OPPA was developed to solve three teaching and learning challenges: (1) how to cultivate abilities and competencies in learners, (2) how to validate that this is achieved, and (3) how to help teachers in improving their teaching. First, to gain an overview of the OPPA, this study examines its basic structure and theoretical framework using the following five points: (a) an academic achievement model that focuses on the formation and acquisition of achievement; (b) a portfolio assessment that focuses on learning processes and change; (c) diagnostic, formative, and summative evaluations on one page; (d) cultivation of learners' competencies by internalization, reflection, and externalization of thought and cognitive processes; and (e) a retrospective self-evaluation of the entire learning. This study then examines the creation of teaching plans and OPP sheets, the application of teaching and learning practices with these sheets, and methods to improve lessons using the sheets. On the basis of the responses of learners who used the OPPA method, its effectiveness is outlined in nine points, such as its capability to transform learning and impart to learners the significance and necessity of learning. Finally, this paper touches on issues not covered by the OPPA, such as teaching methods to increase the competencies of all learners.

1. Positioning of the Issues

Teaching is being conducted in schools nearly every day, and it involves an endless number of issues. If we limit our focus to learners' formation and acquisition of competencies¹ in academic achievement, we can identify the following three issues.

The first is how to teach so as to cultivate competencies in learners. In many cases, teachers are striving to make learners learn the textbook content. While this, too, is definitely an important job of teachers, an even more important job is to cultivate competencies in learners. This is because the acquisition and formation of new knowledge is considered possible by applying learners' existing competencies (Hori, 2006, 6–11).

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The new Course of Study (2008) incorporated more opportunities in teaching for reflection and expression by learners. This in itself is beneficial for the cultivation of learners' abilities and competencies. Nevertheless, it would not be an exaggeration to say that cultivation of learners' competencies, or the ultimate goal of the Course of Study, "zest for living"², remains untouched.

The second issue is to evaluate how competencies gained by learners are being validated. It is necessary to evaluate whether competencies can be cultivated in learners for the purpose of assessing teachers' improvement of their lessons. These need to be evaluated together rather than separately.

To achieve this, it is necessary to first evaluate how learners' prior knowledge and thinking is transformed through the learning process. It is also necessary to use appropriate teaching methods and evaluate their effectiveness. Another requisite is the simplicity of how teachers use evaluation methods on a daily basis. To date, no such evaluation has been proposed.

The third issue is how teachers can improve their classroom teaching to resolve the two issues above (Hori, 2010a, 42–57). The purpose here is to enable learners to improve their academic abilities. In many cases, teachers have used methods, such as seeking observers' opinions or recording and examining lessons to find areas of improvement. These methods, however, have not encouraged teachers to examine their own individual practice. Therefore, it has been difficult to use such methods of evaluation method for specific teaching content. Teachers should be able to carry out class improvement at any time, on a regular basis.

If classes cannot be improved without depending on others, it would be difficult to make sustainable improvements, let alone raise the level of academic achievement, aptitudes, and abilities of learners. Thus, a specific method is required that can be easily used by teachers to improve their classroom teaching.

The One Page Portfolio Assessment (OPPA) was developed as a solution to the above three issues (Hori ed., 2004). This paper first examines the trends in learning and assessment theories based on the OPPA and clarifies that the OPPA is a tool developed as the result of recent academic research. Next, this paper gives an overview of the OPPA, outlines its theoretical background and its connection with teaching and learning practices, and examines its effectiveness and utilization in meeting the aforementioned challenges. Much of this paper is devoted to explaining the OPPA since it is not widely known in an adequate or appropriate manner both within and outside academic circles.

2. Views of Learning and Assessment Based on Constructivism

2.1 Views of Learning Based on Constructivism

From the mid-1980s, a constructivist view of learning began to have a major impact on education, and was first centered in the fields of educational psychology, educational engineering and science, and arithmetic/mathematical education (Steffe & Gale eds., 1995; Philips ed., 2000). This view of learning is centered on the idea that knowledge is not passively transmitted, but is constructed by learners while they actively interact with their environment. If we consider this idea in light of educational practices, we could say that the thinking constructed by the learner regarding discrete content and concepts reflects the learning situation of the person. Learning is not only a process of accumulating substantial knowledge, but also involves interacting with one's surroundings and constructing meaning related to personal experiences.

The following are the three main challenges raised by this view in relation to this paper.

The first challenge is the necessity and importance of clarifying the type of thinking that the learner brings to teaching and learning. The learner's preexisting knowledge and ideas acquired through daily life are called the naïve concept (Osborne & Freyberg, 1985). If meanings are constructed independently in everyday life, we should not ignore those meanings while in the process of teaching and learning.

The second challenge is the necessity and importance of molding the naïve concept into appropriate scientific concepts through teaching and learning. The naïve concept of each learner constructs unique meanings in relation to the surroundings. These meanings encompass the learner's own logical consistency and integrity, and in many cases, they contradict scientific concepts. Furthermore, since such meanings are backed by experience and hence very difficult to change, instruction is required that addresses this issue.

The third challenge is the necessity and importance of clarifying the teaching and learning process in relation to the above. When the naïve concept transforms into a scientific or rational concept, what changes occur in the learner and under what type of influence do they occur? Unless this transformation process is clarified, there is no evidence of whether the learning has been effective. This is closely related to Vygotsky's zone of proximal development, the importance of which has long been identified (Daniels ed., 2005). In other words, it is necessary to clarify the learner's current situation, and implement appropriate teacher initiatives based on that situation. At the same time, it is important to treat teaching, learning, and assessment as an integrated whole. Although such conceptualizations are not widely known in Japan to date, this theory has been generally accepted in the United States, for example, in the form of the "backward design" of Wiggins et al. (Wiggins & McTighe, 2005)³.

2.2 Learning Theory and Views of Assessment based on Constructivism

Learning theories based on constructivism have major implications for assessment theory (Tanaka, 2008). This is because if learning is assumed to be the construction of meanings through learners' interaction with their surroundings, it is necessary to assess what has been transformed, in what way, and in what kind of learning situation. Furthermore, it is also necessary to determine and assess the extent to which the learner's acquired knowledge through learning is accepted in the real world.

The following five points are recent trends in the assessment related to this paper's topic.

The first point is the necessity and importance of basing the assessment on the learner's actual situation and ensuring that the learning gained is something valuable and related to real life. Such assessment is called the "authentic assessment." According to Wiggins, "authentic assessment" is that which "replicates or simulates the contexts in which adults are 'tested' in the workplace, in civic life, and in personal life" (Wiggins, 1998, 24).

As mentioned previously, according to learning theory based on constructivism, learners construct their own world through recognition of events around them and through the process of learning. Therefore, it is necessary to validate what the learner has learned, what the learning outcomes are, and whether the learning can be applied in real life. In short, it is doubtful that traditional measures of achievement have been able to test anything other than particular academic abilities that can only be used in school. Consequently, it is necessary to utilize assessment topics from real life and familiar surroundings, and to examine learners' ability to actually solve and process the issues found in these topics.

The second point concerns the necessity and importance of assessing the learner's naïve concept before the learning and scientific concept after the learning, and instilling in the learner an awareness of the transformation. From the perspective of learning based on constructivism, the main purpose of teaching is to somehow transform the naïve concept into a scientific concept. Consequently, from the assessment perspective, it is naturally necessary to assess the naïve concept before the learning and the scientific concept after the learning. Additionally, self-evaluation plays a major role in making the learner aware of the difference between his/her own constructed meanings and the scientific concept (Hori, 2003, 48–58).

The third point is the importance of assessment that can clarify the instruction and learning process. The view of learning based on constructivism emphasizes a complete transformation through learning. From the assessment perspective, it is important to understand how the naïve concept has changed through teaching and learning. Based on this understanding, the integration of instruction and evaluation becomes possible, leading to an improvement in teaching and learning.

The fourth point discusses the importance of learners' self-evaluation. To have learners' who undergo learning holding a naïve concept change their concept to become more scientific, they need to be made aware of their naïve concept and to recognize the transformation process. If learning is about constructing personal meanings, then education needs to verify what has been learned (Gagnon, Jr. & Collay, 2006, 148).

The fifth point emphasizes the importance of assessment that cultivate learners' competencies. No matter to which learning theory one adheres, the most important aspect of teaching and learning is cultivation of competencies in the learner. Here, cultivation of learners' competencies mean the abilities to think, judge, and express themselves, starting with the content acquired as knowledge during learning, an understanding of the content, and the ability to reflect upon one's learning. Above all, from the viewpoint of constructivism, it is essential that students also cultivate competencies for learning during assessment, because it is through learning that learners construct their own meaning. To date, assessments have tended to emphasize how much learners' have understood the content imparted by the teacher's instruction. Future assessments will have to emphasize cultivation of learners' competencies.

3. Effectiveness of the OPPI and Assessment Conditions Enabling Learners to Understand the Transformation Achieved through Learning

3.1 Assessment Conditions Enabling Learners to Understand the Transformation Achieved through Learning

It is required that appropriate assessment conditions be developed for enable learners to understand the transformation achieved through the learning process in accordance with the five points noted above.

According to the first point, it is necessary for individual learners to think about, judge, and express what they have learned during the learning process. Specifically, such reflective activities are best conducted at the end of each learning process or each lesson rather than after each teaching unit. This is the backdrop to the recent popularity of performance assessment, in which learners express what they have learned.

Regarding the second point, it is necessary to clarify both the content of the learners' naïve

concept brought to the teaching and learning process, and also the content of the scientific concept gained after the learning. This means clarifying the starting point and the destination of the learning, and understanding what has been changed by the teaching and how it has been transformed. On that point, the naïve concept requires a diagnostic evaluation, while the scientific concept requires a summative evaluation (Bloom, Hastings & Madaus, 1971). Furthermore, to compare the change in learners, the assessment questions before and after the learning must be the same. In sum, a method is required that enables learners themselves to become aware of the transformations achieved through the learning process and to understand the implications.

The CLIS (Children's Learning in Science) project has proposed a teaching model that examines how the naïve concept was transformed through teaching and learning by using the same assessment questions before and after the learning process. Unlike the OPPA, it does not assess the transformation using a single page (Children's Learning in Science, 1987).

Regarding the third point, clarifying the learning record is essential since it provides a means of understanding the learning and instruction process. A learning record thought out and expressed by learners is an excellent source of information for formative evaluation, which is of great importance in teaching and learning (Andrade & Cizek, 2010). One way of looking at portfolio assessment, which has been gaining attention recently, is utilization of "learning record" (Hebert, 2001). Individual learners' appropriate use of their own learning record is a key to understanding the transformation achieved through the learning process. A formative evaluation is emphasized from the perspective of teacher instruction in relation to clarification and application of the learning record. This is also connected to the importance of considering teaching, learning, and assessment as an integrated whole.

Regarding the fourth point, OPPA is specifically a self-evaluation by learners. Furthermore, by extension, this is simply the process of confirming and refining learners' metacognition, which is defined as thinking about their own thinking (Hacker, Dunlosky & Graesser eds., 2009). During this process, learners' thinking and cognitive processes are closely connected to fostering and assessing their self-assessment abilities and metacognition. In this process, to be specific, the learner receives something as information (internalization), thinks it over (reflection), and expresses the result (externalization) (Sawyer ed., 2006). In other words, these are initiatives for gaining an understanding of the learning situation, deepening that understanding, and improving the situation. It is required that assessments be conducted based on such connections.

The fifth point is an appropriate initiative to be taken by teachers on the basis of assessment results, since it relates cultivation of learners' abilities and competencies. For example, competencies for learning would consist of the ability to distinguish between naïve and scientific concepts; the ability to internalize, reflect, and externalize their cognition and thinking process; the ability to appropriately predict and review learning; and the ability to revise and improve one's own thinking by reflecting on the whole learning process.

During the formation process of learners' competencies, the following functions are at work: diagnostic, formative, and summative evaluations before, during, and after the learning; portfolio assessments that promote a growing understanding of the learning process; performance assessments that enable the expression of what has been learned; and self-evaluation for learners to monitor their learning.

3.2 OPPA and Its Effectiveness

The OPPA is an approach proposed in response to the previously examined learning and

assessment theories. Before going into specific detail, we will discuss the effectiveness of the OPPA in terms of assessment conditions that enable learners to understand the transformation achieved through learning.

First of all, OPPA treats not just the assessment but also learning and teaching as an integrated whole. It is structured in such a way that the OPP sheet created in the teaching plan stage is also used during the teaching and learning processes to achieve the goal of improving both these processes. To date, few methods have been proposed that have managed to treat assessment, learning, and teaching as an integrated whole.

Secondly, the following five functions are made possible on a single page: (1) ascertaining the learner's understandings through diagnostic, formative, and summative evaluations; (2) portfolio assessment, performance assessment, and self-evaluation; (3) increasing learners' metacognition and self-assessment abilities, such as the abilities to think, judge, and express oneself through appropriate internalization, reflection, and externalization of thought and cognitive processes; (4) facilitating improvement in classroom teaching as a result of using the content expressed by learners as learning record; (5) enabling learners to become aware of the significance and value of learning and to feel a sense of self-efficacy. No method has been implemented previously that manages to achieve all of the above on a single page.

Thirdly, OPPA can be applied to all academic and extracurricular subjects and to most school settings, from elementary schools to universities. What is required in the overworked education workplace is a simple and highly universal tool or method, and the OPPA is such a method.

4. Definition of OPPA

The OPPA is a self-evaluation method for learners in which the desired teaching outcomes are recorded on a One Page Portfolio Sheet by learners before, during, and after the classes as a learning record (Hori ed., 2004, 10). As will be mentioned in detail later, this method differs from a typical portfolio assessments as it uses only one page and aims to make the most of the minimum amount of information required for assessment.

The content recorded by the learner on the OPP sheet is structured such that it enables the teacher to check learners' progress before, during, and after the learning and to use the information to make adjustments in teaching. It also provides learners with a visual understanding of their progress using specific content, and enables them to cultivate the ability to learn and think for themselves.

To date, worksheets and exercise books have been widely used as written records of teaching. These differ completely from OPP sheets in the following four ways (Hori ed., 2006). First, worksheets and exercise books (hereafter referred to as "the former") and OPP sheets (hereafter referred to as "the latter") are both used to represent the knowledge and thoughts gained by the learner. However, the former, in many cases, involves learners copying what the teacher has written on the blackboard and other specifically-designated content, while the latter requires learners to express the content in their own way.

Second, the former provides few opportunities for teachers to modify their teaching methods on the basis of the recorded content immediately after class, while the latter makes this possible. Formative evaluation, which is essential to achieve the objectives of teaching, is difficult with the former, but easily possible with the latter.

Third, the latter is structured on the basis of individual teaching units, thus forming a clear connection with the unit before, during, and after the learning, and making it easy for the teacher to review. In the former, the recorded content is very similar to a memo. Since in many cases these memos are not learners' thoughts, it becomes difficult to comprehend what is written where, making learning activity difficult to follow.

Fourth, when the latter are completed, they provide an understanding of the entire learning in a structured format. This is difficult to achieve with the former. To understand the learning content, it is essential that the outcomes of learning are not fragmentary but can be understood in a structured format.

5. Basic Features and Background Theory of OPPIA

5.1 Basic Structure of OPP Sheets

The OPPIA usually involves creation of an OPP sheet, which forms the basis for a teaching unit within the teaching plan. Learners record their learning on the sheets after each lesson. The teacher attempts to improve the students' learning by checking the contents of the sheets and making appropriate comments. This process is repeated, and at the end of the teaching unit, learners complete a self-evaluation of the entire learning content.

Figure 1 shows the components and overview of the OPP sheet. The sheet comprises four components: I. Unit Title, II. Essential Questions Before and After the Learning, III. Learning Record, and IV. Self-Evaluation after the Learning. Component II comprises diagnostic and summative evaluations before and after the learning; component III consists of a formative evaluation during the learning; and component IV comprises a summative evaluation after the learning (Hori, 2009a, 1–7).

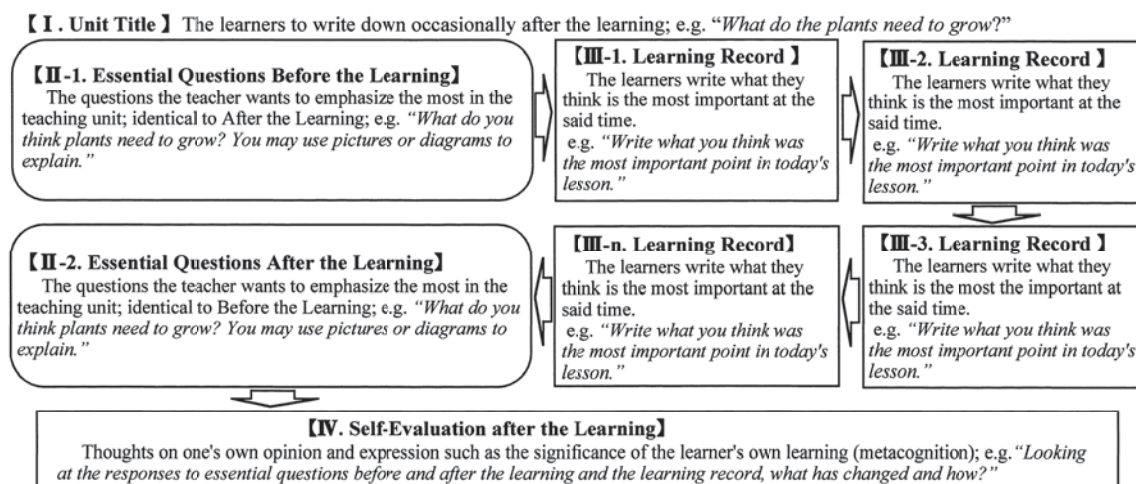


Figure 1 Components and Overview of the OPP Sheet

Figure 2 shows the relationship between these three evaluations and the OPP sheet (Hori & Nishioka, 2010, 226). The internalization, reflection, and externalization indicated in Figure 2 will be described in detail later. In general, a teaching unit uses a single sheet that incorporates elements discussed in Figures 1 and 2, and is filled in by the learner once the lesson is completed.

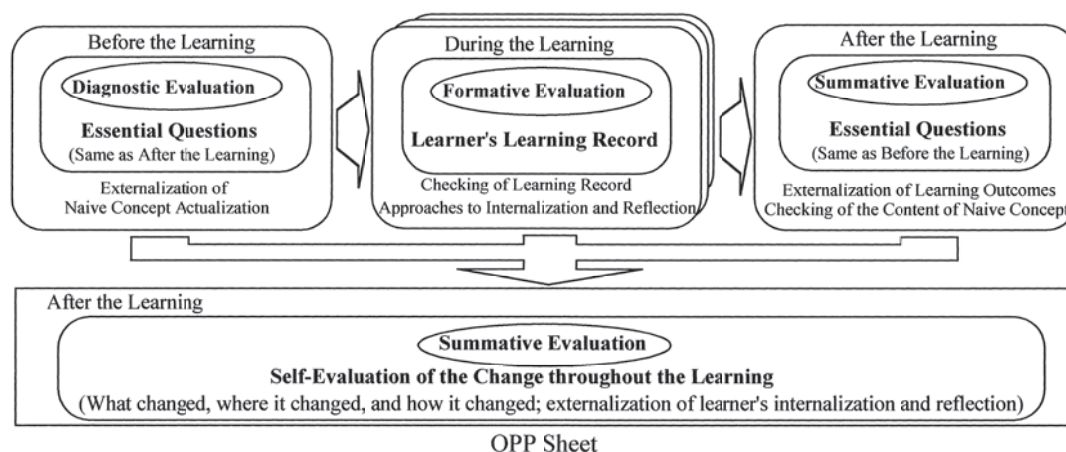


Figure 2 The OPP Sheet and Diagnostic, Formative, and Summative Evaluations Before, During, and After the Learning

Accordingly, the OPP sheet is not something to be used in the class but is a tool for integrating the teaching with the learning. In other words, it is used to clarify the teaching and learning issues mentioned in Section 1 and to plan for improvement.

The following five points underlie the theories and thoughts behind the OPPA.

First, it is based on an academic achievement model that focuses on cultivation of learners' competencies. This requires an assessment of the academic achievement model that examines how the learner is forming and acquiring competencies through the development of teaching and learning, and also reviews the achievement process itself.

Second, the model functions on the idea of incorporating a portfolio assessment to clarify the progress and changes in learning through the evaluation of the learning record before, during, and after the learning.

Third, diagnostic, formative, and summative evaluations are all carried out on a single OPP sheet. Particular emphasis is placed on formative evaluation.

Fourth, the learner internalizes, reflects, and then externalizes the thinking and cognitive processes through the learning record. This process cultivates learners' competencies.

Fifth, the learner reviews the entire OPP sheet and performs a self-evaluation to develop metacognitive ability.

In general, the above five points are treated individually or two at a time; they are never dealt with all at once. The most distinctive feature of the OPPA, however, is that it enables all five points to be dealt with simultaneously. Below, we shall clarify these points forming the theoretical framework of the OPPA.

5-2 Theoretical Framework of OPPA

5-2-1 Academic Achievement Model focusing on the Formation and Acquisition of the Achievement

Although many academic ability models have been proposed in the past, none of them clarifies the formation and acquisition process of academic ability. Figure 3 shows learners' competencies cultivated through OPPA and its formation process (Hori, 2011, 19-22).

The bottom part of Figure 3 shows the transformation process. The OPP sheet demonstrates how the learner's naïve concepts before the learning change to scientific concepts after the learning.

In this process, the learner internalizes, reflects, and then externalizes thinking and cogni-

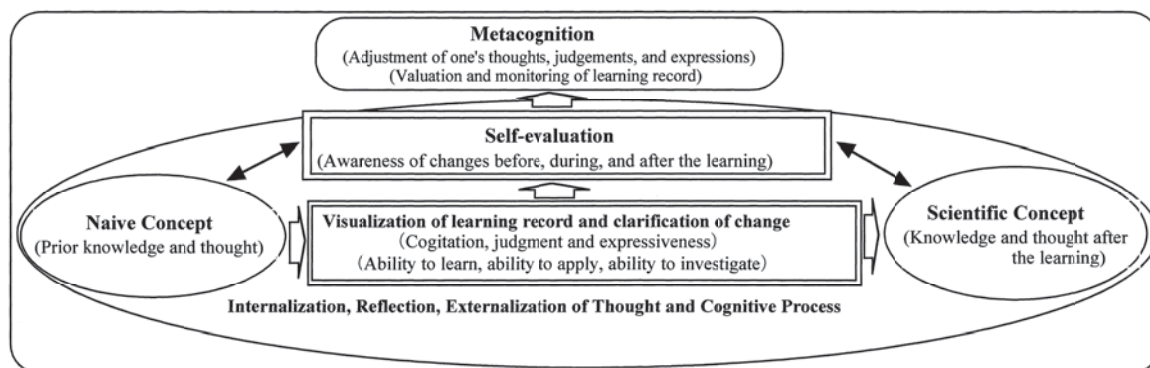


Figure 3 OPPA Academic Achievement Model

tive processes through interactions with the teacher, while forming and acquiring the abilities to learn, apply, and investigate. By writing down “the most important part of the lesson” throughout the learning process, the learner also develops abilities for cogitation, judgment, and expressiveness. On the OPP sheet, self-evaluation during each step and for the whole learning process indicates the fostering of metacognitive abilities.

As this model demonstrates, the following elements are essential to the cultivation of basic competencies as well as advanced academic ability: learner awareness of transformation before, during, and after the learning; the internalization, reflection, and externalization of thinking and cognitive processes that promotes such awareness; self-regulation of thinking, judgment, and expression; and valuation and monitoring of the learning process. The OPP sheet validates this approach.

5.2.2 A Portfolio Assessment that Emphasizes the Learning Process and Transformation

To date, portfolio assessments have been used in the Period for Integrated Study. As is well known, a portfolio is a systematic accumulation of the students’ projects, other learning activities, and the teacher’s guidance and assessment records. A portfolio assessment incorporates all these teaching and learning activities. Recently, it has also begun to be incorporated into the regular curriculum. This method of assessment has attracted attention because it has the advantages of detailing the learning process and transformation, and it provides an understanding of the learners’ progress.

Despite these advantages, there are some problematic aspects regarding portfolio assessments.

First, learning activities and assessments take place before teachers are fully aware of the learner’s prior knowledge and thinking.

Second, it is difficult for participants to identify what is important, because too much information is provided in the learning process, and therefore it is often difficult to choose relevant information.

Third, because learning activities and assessments proceed before the learner’s prior knowledge has been clarified, it is also difficult to ascertain what and how much has been learned.

To overcome these issues, OPPA is created as a portfolio assessment on a single sheet in which the “Essential Questions” clarify the state and transformation before and after the learning, and the only thing expressed as learning record in the learning process is “What was most important in the lesson?” In other words, it aims to fully utilize a minimum amount of information.

The emphasis on the learning process and transformation is highly significant to the points listed below. This is because learning transformation brings about a realization of self-efficacy and of the significance and necessity of learning. The following sections review methods that promote learning transformation in learners, create awareness of such transformation, and add meaning to the transformation.

5.2.3 Introduction of Performance Assessment

There were several recent trends in assessment research discussed at the the beginning of this paper. The importance of performance assessment is emphasized to find out whether knowledge and skills can be fully and appropriately used in realistic contexts and settings (Tanaka, ed., 2011). In short, existing assessment methods have been unable to adequately assess learners' actual learning situations. Therefore, when assessing learning acquisition, it is essential to determine learners' competencies for solving real world issues.

Performance assessment requires indices and standards for judging the level of attainment and the degree of success. This is called a rubric (Doran et al., 2002). Consequently, to conduct a performance assessment, a rubric must be created. Therefore, many teachers must take part, and the assessment results for the same assignments must be similar regardless of who uses the rubric. Furthermore, since it is important that the standard for judgment is made clear to learners, considerable time and effort must be spent in its creation. Consequently, the challenge is to achieve high efficiency and reliability in the indices and standards for judging the learning outcomes without taking up too much time.

The more distinct the rubric is made, the clearer the teacher's so-called expected range. However, another challenge arises as to the assessment of an unexpectedly high result. In other words, learners sometimes exhibit abilities beyond our expectations. Since these results are not within the indices and standards, it is possible to overlook them or regard them as unimportant. There is a possibility that indices and standards created for an appropriate assessment may curtail learners' potential.

The OPPA allows learners a space for writing "the most important part of the lesson" into the learning record. This is a type of performance question. Does it require indices and standards for what the learner has written? Although such indices and standards could be created if there was time, it is probably unnecessary.

This is because when conducting a lesson, the teacher usually has certain goals for what to cover and what he/she wants learners to learn in that lesson. Therefore, "the most important part of the lesson," as written down by learners in the learning record, is already clear to the teacher. In other words, that is the rubric. How should the teacher judge the breadth and depth of what is written? This should be judged by the degree to which "the most important part of the lesson" written down by learners closely resembles what the teacher wanted to be written there.

By doing this, the teacher can conduct the assessment single-handedly. Specific, simple methods for ensuring the validity and reliability of the assessment need to be investigated. The OPPA suggests one such method.

5.2.4 Diagnostic, Formative, and Summative Evaluations on One Page

The teaching plan is based on a diagnostic evaluation of what and how much learners understood before the lessons, and what and how much they learn during the lessons. The teaching is conducted to achieve the lesson objectives. A formative evaluation is carried out during the

teaching process, which involves understanding learners' transformation and revising and improving the process where appropriate. Finally, a summative evaluation examines the extent and level of the learning acquired throughout the learning process.

Diagnostic, formative, and summative evaluations are vital to draw out and foster learners' potential and to improve the teacher's teaching methods. Yet, in many cases, these three have been treated individually, and no methods have been implemented to produce an organic relationship between them. Moreover, no methods have been proposed that would clarify and enable conducting these three evaluations together while viewing the progress of teaching and learning. Consequently, despite there being some understanding of the importance of these three evaluations, it has not been made clear how the expected teaching and learning outcomes could actually be achieved.

As demonstrated in Figures 1 and 2, OPPA enables an organic relationship between the three, and their overall structure can be seen on the OPP sheet through learners' records. Consequently, it is now possible to overcome the issues present in diagnostic, formative, and summative evaluations.

5.2.5 Cultivation of Learners' Competencies through Internalization, Reflection, and Externalization of Thinking and Cognitive Processes

Internalization, reflection, and externalization of thinking and cognitive processes by the learner is closely related to what has been previously discussed on portfolio assessment and diagnostic, formative, and summative evaluations (Hori, 2009b, 12–22; Yamashita & Hori, 2009, 23–35; Sawyer, ed. 2006, 1–16). This is because such assessment methods provide an understanding of the internalization, reflection, and externalization of thinking and cognitive processes by the learner and acts on them. Figure 4 depicts the relationship between cognitive structure—the framework in which the learner recognizes things—and the internalization, reflection, and externalization of thinking and cognitive processes.⁴

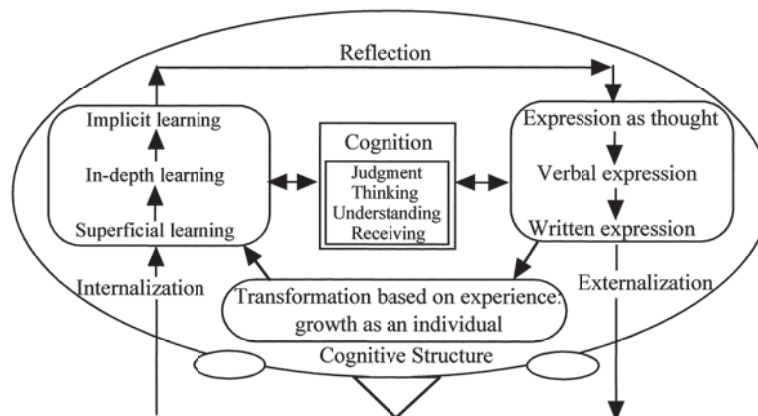


Figure 4 Internalization, Reflection, and Externalization of Thinking and Cognition and the Cognitive Structure of the Learner

Internalization of thinking and cognitive processes implies incorporating something external into one's thinking and cognitive process. Reflection is the process of intentionally examining one's ways of thinking and doing things. Although the two are very closely linked, it is not clear whether internalization is achieved by reflection, or vice versa, or whether they occur at the same

time. Let us presume that reflection occurs after internalization.

Simply put, externalization is the outward expression of the thinking and cognitive processes taking place within the learner. The outward expression is simply the manifestation of the thinking and cognitive processes. Because this manifestation can be manipulated while memories are preserved by entrenching external cognitive results and processes, it can reduce the load of information processed. In general, people externalize their intermediate cognitive activity for validation, and it is easy to link this with producing benefits, such as re-examination of cognitive activity, sharing, and gaining new perspectives.

Additionally, if the thinking and cognitive processes are externalized, manipulation becomes easier, such as comparing, contrasting, and compiling it as the object of reflection; thus, externalization facilitates reflection. Where there is coordinated cognitive activity, the cognitive processes are mutually externalized and naturally require a comparative examination of mutual processes, making it conducive for reflection to occur. Viewed thus, in terms of presenting one's own cognitive processes in a tangible and discernable form, externalization of the cognitive processes is essential to facilitating internalization and reflection; the two cannot be considered separately. Furthermore, because internalization and reflection involve examining, adjusting, revising, and compiling one's own cognitive processes, they cannot be ignored as far as cultivation of metacognition—thinking about one's own thinking—is concerned.

To date, teaching and learning have been comprised of internalization by absorbing information from textbooks, from other learners and teachers, reflection by examining and considering this new information, and externalization by writing in exercise books and worksheets or by giving presentations. The issue, however, is that internalization, reflection, and externalization of thinking and cognitive processes have not been functioning properly in educational practices. For example, regarding internalization and reflection, it is difficult to tell whether guidance is being given to absorb the relevant information and being applied appropriately. As for externalization, even if learners record the content written by the teacher on the blackboard in their exercise books, the problem still remains that they are not necessarily externalizing their serious thoughts.

It is important for teachers to take steps to ensure that the internalization, reflection, and externalization of thinking and cognitive processes are functioning properly. The OPP sheet makes this possible. The learning record on the OPP sheet and the retrospective self-evaluation of the entire learning process in particular are factors that ensure internalization, reflection, and externalization. Learners externalize “what was most important in the lesson” on the OPP sheet. The teacher then writes appropriate comments and encourages learners' internalization and reflection. This can produce a spiral effect, leading to the next externalization. This is a process of formative evaluation that can be used for instruction.

5.2.6 Self-Evaluation that Reviews the Entire Learning Cycle

One of the ultimate aims of education is to nurture human beings who can continue learning on their own once their formal education has completed. This typically involves having appropriate objectives for learning, engaging in relevant self-evaluation, and improving one's learning. The problem here is that learners in formal education often do not possess no initial objectives for learning new content. Of course, learning cannot usually begin without the teacher's instruction, and teachers have not expressly taught the cultivation of the ability to learn and think independently.

Why, then is it so difficult to cultivate these abilities in everyday teaching? There are two

reasons. One is that the ability to learn and think independently is difficult to acquire, as it involves both the application of the individual pieces of acquired knowledge, and also metacognitive abilities, such as practical application, judgment, and revision. The other reason is that teachers already have their hands full with their everyday teaching, imparting knowledge and skills. Many simply have little time, energy, or commitment to cultivate these advanced abilities.

Nevertheless, even in their everyday teaching, teachers are able to cultivate the competencies of learners through learning activities. As shown in Figure 1, OPPA asks learners to first think about the knowledge they have prior to the lessons, then write down the most important part of each lesson, and finally examine how their prior knowledge and thinking have been transformed into a self-evaluation of the entire learning (Hori, 2003). This method is an awareness tool in which learners evaluate their own progress before, during, and after each lesson. In other words, they use the OPP sheet to visually monitor how their own learning is being evaluated throughout one teaching unit with specific content, while also recording the most important points of teaching.

In the past, self-evaluation only involved a small contribution by learners to a teacher evaluation at the end of a lesson. This was due to two main reasons. First, “there is a lack of the belief that the learning process progresses from regulating the struggle between the known and the unknown” (Tanaka, 2008, 164). Second, self-evaluation has been nothing more than a “way to invite [learners] to simply express their ‘thoughts’ and ‘impressions’ on teaching” (Tanaka, 2008, 164).

The basic structure of OPPA, however, has at its core the self-evaluations. The first is an evaluation of the transformation in response to the essential questions before and after the learning. The second is an evaluation of the internalization, reflection, and externalization of thinking and cognitive processes through an exchange between learners and the teacher. The third is an evaluation of the entire learning process, including the two evaluations above. By using these three evaluations, differences between learners and the teacher in terms of educational objectives and their achievement are eliminated. As learners’ self-evaluation abilities increase, so does their potential for academic achievement.

6. Learning and Teaching and the Structure of OPPA

6.1 Creation of Lesson Plans and OPP Sheets

Teachers create lesson plans for their classes. The OPP sheets, which are useful in both learning and teaching, need to be created at the same time the lesson plan is created. This is because when the teacher is working on developing the learning and teaching aspects of a unit to be implemented, both the lesson plan and the OPP sheet help in clarifying what the teacher conveys to learners, and what kind of learner competencies the teacher wants to cultivate (Hori, 2010a, 42–57).

Since the OPP sheet also serves to check and correct the content of the lesson plan, it is important to create the sheet together with the plan. At this stage, the teacher can indicate in the lesson plan which part of the OPP sheet is to be included in which lesson. In many cases, teachers note in their lesson plans that the objective of their lessons is to have learners understand the textbook. In such cases, teachers may also want to incorporate some of the competencies that could be cultivated in learners using the OPP sheet.

The following is an overview for creating OPP sheets (Hori, 2009a, 64–71). Figure 5 shows an actual OPP sheet that has been created and used in a first-grade junior high school science unit,

【 I . Unit Title: Mechanism and Function of Roots and Stems 】

【II-1. Before the Learning】
*What happens to water absorbed by plants?
 You may use pictures or diagrams to explain.*

The water absorbed by the plant —
 ↓
 becomes moisture for the plant to grow. It becomes moisture for the plant to absorb and to grow bigger.

【III-1. Learning Record: Lesson 1】
Write what you think was the most important point in today's lesson.

~The function of root hairs~
 - make it easier to absorb water
 - make it easier to absorb water and the nutrients in the water as the surface area of the root grows
 - make it less easy for the root to come off

Root hairs

Summary:
 When the plant absorbs water and nutrients present in the water, root hairs make it easier for the plant. As the surface area of the root grows larger, it becomes easier to take in water and the fertilizer carried by the water and harder for the root to come off.

【III-2. Learning Record: Lesson 2】
Write what you think was the most important point in today's lesson.

How is water absorbed by plants?
 First it is carried by the vessels in the root to the vessels in the stem, then by the vessels in the leaves.

The water is used for photosynthesis and growth.

The surplus water comes out from the stoma on the leaves and transpires.

The vessel is connected to the root, stem, and leaves.

【II-2. After the Learning】
*What happens to water absorbed by plants?
 You may use pictures or diagrams to explain.*

Q. What happens to water absorbed by plants?
 A. Water absorbed by plants travels through the root hairs, which make it easier for the plant to absorb the water and the nutrients in the water. The root hairs also help to prevent the root from coming off. Water absorbed by the root hairs is carried by the vessels in the root to the vessels in the stem and then to the leaves. The water preserves the cells of the entire plant, is an ingredient for photosynthesis, and dissolves the nutrient buildup in the leaves and carries it away. We also learned that if there were no leaves, no water would be drawn into the plant.

Summary: Water flow
 First, vessels → roots → stem → transpires from the vessels in the leaves.

【III-1. Learning Record: Lesson 4】
Write what you think was the most important point in today's lesson.

1. Water movement in a leaf
 Water coming out of the vessels becomes vapor and comes out the stoma.
2. What propels roots to draw up water?
 When transpiration takes place, the roots spread water.
3. The role of water
 - preserves the cells of the entire plant, is an ingredient for photosynthesis, the nutrient buildup in the leaves is dissolved in the water and carried away.
4. Water flow
 Vessels → roots → Transpires from the vessels in the leaves and stems.

【III-3. Learning Record: Lesson 3】
Write what you think was the most important point in today's lesson.

Examining the Amount of Transpiration:
 First, examine the reduction rate of the water.
 A had leaves as normal.
 B had leaves coated with Vaseline.

Result:
 A lost a lot.
 B lost only a little.

Summary
 We saw that water would not be absorbed without leaves. Water will not be absorbed without transpiration.

【IV. Self-Evaluation by Reviewing the Entire Learning】
Looking at before and after the learning, has your thinking changed? If so, how has it changed? Write in detail.

Before the learning, I simply thought that water provided moisture for plants to grow. However, as the teaching built up lesson by lesson, I began to realize that the plants around me were quite fascinating. At first, I was not really interested in this topic, but the lessons became very enjoyable. I am surprised at the change that took place in me. One thing that I learned was to hope that I can become someone who does not start out with thinking something as boring but makes an effort to enjoy the learning process.

Figure 5 Example OPP Sheet Entries for “Mechanism and Function of Roots and Stems.” (Filled by First-grade Junior High School Girl)

“Function of Plant Roots and Stems.” Four hours of teaching were conducted for the unit. As previously mentioned, the OPP sheet consists of four components: (I) Unit Title, (II) Essential Questions Before and After the Learning, (III) Learning Record and (IV) Self-Evaluation.

The unit title is usually written down by the teacher and occasionally by learners after the unit is completed. This enables learners to develop the ability to review the whole unit and accurately summarize it.

The essential questions asked before and after the lesson were exactly the same so as to enable a comparison and to evaluate the learner transformation achieved by the learning. These questions are related to the knowledge that the teacher wants to check and convey the most throughout the unit. It is also important to prepare a question that can be answered before the learning. Questions that simply relate to the presence or absence of a memory are not suitable for this purpose. In Figure 5, the teaching unit is about “The Mechanism and Function of Roots and Stems,” and the content deemed most essential is the understanding of “what happens to water absorbed by plants?” This question is asked both before and after the learning.

The Learning Record section is filled in for each lesson as the answer to “what do you think was the most important point in today’s lesson?” Since the OPP sheet uses a single page, units with many lessons need to be divided into smaller units and arranged so that the Learning Record can fit onto one page. Answering “what do you think was the most important point in today’s lesson?” encourages learners to develop the ability to choose relevant information from the teaching and learning, think about it, and express it in their own way. Learners can express this in words or pictures (See Figure 5, Learning Record Lessons 1 and 2). Learners also sometimes add a “title”

to the Learning Record, which fosters their ability to appropriately express the content of a lesson.

The Self-Evaluation section asks learners to review the entire learning to analyze what has changed, how it has changed, why it has changed, and what they think about the change. Therefore, it is important to structure the section in such a way that the learning process and transformation from I to III are clear. As demonstrated, self-evaluation is actually conducted in each component of the OPP sheet, but it is particularly important to self-evaluate after the entire learning.

The OPP sheet lays out the above components on one page. The way these are laid out is of great significance. For example, it is desirable that the essential questions asked before and after the lesson are arranged as shown in Figure 1 so that their answers can be easily compared. It is also imperative that the Learning Record section is placed between the essential questions before and after the learning, and that the self-evaluation section is placed in a way that each component and the overall sheet can be easily viewed while filling out this section. Thus, close attention should be given to the arrangement of each component on the OPP sheet since it is closely linked to the sheet's objectives.

6.2 Implementation of Teaching and Learning and Application of the OPP Sheet

Once the lesson plan and OPP sheet have been created and the teaching has been conducted, five to ten minutes at the end of the teaching and learning should be spent filling out the sheet. As previously mentioned, the teaching and learning are conducted normally. The following is a detailed explanation of the application of the OPP sheet.

6.2.1 Application before the Learning

Before the lesson begins, learners answer the “essential question before the lesson” to clarify their naïve concept, that is, their prior knowledge and thinking. This gives the learning a clear starting point, which is an essential prerequisite to be able to judge what has been transformed as a result of the learning and how it has been transformed.

6.2.2 Application during the Learning Process

During the learning process, learners fill in the Learning Record section of their sheets. This record of learning is essential to improve the teaching and learning process. Learners externalize “the most important part of the lesson,” which provides an indication of the knowledge retained in their minds, and this also enables the teacher to gauge their understanding of the learning content. If this understanding differs substantially from what the teacher had intended to impart, the teaching must be deemed inadequate. The next section will explain this point in greater detail.

The application of the OPP sheets during the learning process plays the most important role in ensuring the proper functioning of the internalization, reflection, and externalization of the thinking and cognitive processes. This requires that learners write in the Learning Record section what they think was the most important part of the teaching. This serves the following two main purposes.

First, it helps learners to cultivate the ability to think independently about the important aspects of the lessons learned, select the most important content, and express it appropriately. In other words, learners develop their abilities in cogitation, judgment, and expressiveness.

Second, application of the OPP sheets improves the quality of learning by encouraging learners to carefully consider the teacher's relevant comments on the content that they externalized

during the learning record, internalize them through reflection, and connect them to the next externalization. Improving the quality of learning applies not only to the learners who did not properly understand the lesson but to all learners. Therefore, appropriate efforts by teachers exert a great influence on the formation and acquisition of learners' academic capabilities.

6.2.3 Application after the Learning

After the lesson, learners answer the essential question on the OPP sheet and perform a self-evaluation. This allows them to review the entire lesson and to discover their own transformation in the process, in addition to gaining an understanding of the value and significance of their learning. Since the essential question after the lesson is identical to that before the lesson, it is easy to compare the answers and view the transformation. Therefore, this question must be appropriate to the function it serves.

The OPPA self-evaluation differs greatly from other types of self-evaluations. Self-evaluations in general consist of a yes/no question asking learners whether a particular lesson was interesting or not. Such practice, however, has limited usefulness in improving lessons and in achieving learning objectives. In contrast, the OPPA self-evaluation is designed to promote internalization, reflection, and externalization of thinking and cognitive processes as well as to attach meaning to the learning. When it performs its function properly, it stimulates metacognitive ability in learners.

The OPP sheet is a record of what is learnt before, during, and after the lesson. Since it provides a view of the entire learning process in specific detail, the learning transformation can be observed. It can be inferred that a transformation took place simply because the learning outcomes are clearly visible. In other words, the sheet is linked to the learners' realization of the significance and necessity of both learning and self-efficacy.

The OPP sheet, when all of its content is completed, becomes a fine portfolio of the learner's work. The greater the extent to which it is completed, the greater the self-efficacy of the learner.

6.3 Improving Lessons with OPP Sheets

6.3.1 Judging the Appropriateness of the Teaching by Using the Learning Record

The OPP sheet can be used to improve classroom teaching (Hori, 2010b, 146–161). As already mentioned, learners record “the most important part of the lesson” in the learning record section of the OPP sheet. The appropriateness of the teaching is determined by whether that content corresponds well with the knowledge that the teacher had intended to impart. If it does not, there is room for improvement in the teaching. If such a situation arises with only one or two learners in a class, then it is perhaps not a major issue. However, if the majority of learners has written something other than what the teacher intended to teach, there is probably a major problem with the teaching.

Ideally, the quality of learners' learning records should improve with time. To accomplish this, the teacher should consider taking appropriate actions. This holds true for all learners—there needs to be improvement not only for learners who are unable to appropriately fill in the learning record, but also for those who have no trouble completing this task. Nevertheless, this process of constant improvement can be considered quite difficult, and this is one of the major challenges when using the OPP sheet.

6.3.2 Improving Classes Based on the Outcomes of the Learning Record

There are two methods for improving lessons through use of the OPP sheet's Learning Record section. One method is applied when the problem is not with the teaching but with what is being recorded in the learning record. In many cases, this results from learners not being able to properly understand the lesson content. In such cases, it is necessary to allow some time at the beginning of the next lesson to revise the previous lesson's content. In other words, the teacher should provide appropriate guidance before learners' make further mistakes. (Yamashita & Hori, 2010a, 327–337).

The other method applies when the content of the Learning Record differs from what the teacher intended to teach because the teaching content lacks a proper flow or deals with an unsuitable topic. In such cases, an improved teaching plan should be created for the next time the unit is implemented.

The following is an example of such a case in which the teaching content lacks a proper flow (Yamashita & Hori, 2010b, 20–42). This was a sixth-grade elementary science unit titled "The Way Things Burn and the Air." The start of the unit focused on the fact that objects normally require oxygen to burn. Accordingly, the flow of the lesson involved extinguishing a candle flame to show the necessity of oxygen. However, in many cases, learners focused on the phenomenon of "extinguishing", and paid little attention to the presence or absence of oxygen. This was because, in trying to demonstrate "what is necessary to make something burn," the lesson overemphasized the phenomenon of "extinguishing." Accordingly, the problem was overcome through lesson improvement by spending one classroom hour on teaching about "extinguishing" and another hour about "what is necessary to make something burn?"

This improvement was made possible because of learning record. In many cases, educational assessment has been aimed at assessing learners and the lessons separately. Unlike many other methods used, the OPPA has demonstrated its effectiveness for assessing both learners and teachers.

7. On Learners' Evaluation of the OPPA

This section more closely examines the effectiveness of the OPPA. The following nine attributes have been indicated based on the responses of learners who have used OPP sheets. Except for attributes 5–9, all responses given here were written after the lessons by learners who used OPP sheets. Within the responses given below, "learning steps," "self-evaluation card," "history chart," "learning footprint," and "evaluation card" all refer to the OPP sheet. Detailed explanations have been omitted given the large number of responses involved.

(1) The essential value of educational evaluation is conveyed to the learner

"You know best the key to your own growth." (First grade junior high school girl)

"These learning steps are easy to use. The teacher marks things in red, and I am filled with hope when opening it." (Third grade elementary school boy)

(2) Learners become aware of the transformation in their learning

"Because the content that was written down increased from before the learning in lesson 1, lesson 2, lesson 3, and lesson 4 to after the learning, I noticed that my comprehension had improved.

It was good to have the learning steps. I was quite pleased to see that I was writing more and more. It is amazing to be able to understand so much in just four lessons (it was four lessons, wasn't it?).” (First grade junior high school girl)

(3) Learners become aware of their own internal growth

“I thought it was great that by writing down the most important things, I could look back at the sheet and see how much I was listening to the lessons. It was very handy because I could also see how much I had understood afterward. Before we had the self-evaluation card, I didn't think about what was important; I just solved the problems and that was it. Now we can write on the self-evaluation card, and I have been able to see what was important in the lesson. ...When I started writing on the self-evaluation card, I began to understand a lot of important things in the lesson. I thought that having the self-evaluation card was good.” (Second grade junior high school girl)

(4) It provides learners with concrete learning objectives

“I think it was good to have the self-evaluation. The reason is that by retaining what we learned in the lesson, we can understand the next lesson. I think that self-evaluation is very important for my own growth—I have become what I am now because of the self-evaluation card (OPP sheet). It might seem exaggerated, but by retaining what you have learned as well as understanding your strengths and weaknesses, you'll know what you need to revise. In the future, I would like to continue taking time and concentrate on what I write. I want to tackle my second semester by using self-evaluation cards again. Finally, I want to thank the teachers who thought up and proposed using the self-evaluation cards. I want to continue making use of the card for my future growth.” (Second grade junior high school boy)

(5) It conveys the significance of learning to learners

“I love the learning record chart. I can look back at myself and see my growth at a glance. It was no trouble to write, it was even enjoyable. The specific good points were:

- (a) It is like a kind of a game.
- (b) You can check what you just studied.
- (c) It is fun looking back later (you know nothing at all to start with, but by the end, you know a lot and it really feels like you have grown).
- (d) You can use your brain (you think about what to write, what you learned, and what you thought about it).” (Third grade senior high school girl)

(6) It conveys the necessity of learning to the learner

“I never imagined that creating a beautiful harmony required such a thorough technique. Being aware of these three things (rhythm, harmony, and nuance) made such a difference to the mood of the song.” (Second grade junior high school girl)

(7) It can give the learner self-efficacy

“I really feel that I have accomplished something.” (Second grade junior high school boy)

“When I first saw the self-evaluation card, I thought that we never did anything like this at elementary school. But when I actually tried using it, I found that it was very handy. This is because I can tell how much I have learned before and after studying.” (First grade junior high school boy)

(8) It cultivates learners' competencies throughout the learning record

"I love these 'Learning Footsteps.' Since I started them, I have been able to concentrate on the lesson. I have become very good at listening for the important parts and at summarizing the day's lesson. I also think that the booklet is well-organized and clear." (Sixth grade elementary school girl)

"It is good that you can try answering the same question both before and after the learning and see what you have become able to do that you couldn't do at first. Just by looking at the evaluation card you can see where the important parts are." (Second grade junior high school boy)

(9) It provides the teacher not only with a progress report on status of learning but also other appropriate information, such as an evaluation of teaching

-The gap between the "important part" that the learner recorded in the Learning Record section and the content that the teacher intended to highlight provides an effective evaluation of the teaching.

-The teacher's comments on the OPP sheet learning record can form a means of indirect communication between the teacher and the learner. This can be effective in junior and senior high schools where individual subjects are taught by different teachers.

There are other ways to gauge the effectiveness of OPPA in addition to the above, such as collecting the opinions of teachers who have used it. However, those who can inform us most eloquently and accurately of its effectiveness are learners who have used it.

The OPPA is not without problems, as mentioned in this paper. In the future, I would like to examine how teaching and learning can be used to overcome the remaining issues related to teacher efforts to raise the quality of learning for all learners.

8. Future Issues

The OPPA was developed in Japan in 2002 and has since been adopted and used in classroom and extracurricular activities. A small number of research studies have examined the relationship between the existing assessment in educational sites and performance assessment of learning record. These results have clearly indicated that even if a school performs very well in normal assessment, its learning record may be inadequate, and vice versa (Kanzawa & Hori, 2011). Therefore, further research is necessary which explores the remaining issues regarding the detailed theoretical investigation of the OPPA and its effectiveness.

Notes

1. Learners' competencies mentioned here refer specifically to the capacity to think, judge, and express themselves, based on the content acquired as knowledge during learning, their understanding of the content, and their ability to think about one's own thinking.
2. The Course of Study, which was again revised in 2008, insists on fostering a "zest for living." This "zest for living" comprises three elements: "solid academic capabilities," "rich humanity," and "health and physical fitness." "Solid academic capabilities," or the intellectual side of the "zest for living," is defined as "academic abilities needed by the children of the future with a will to learn, including reflection, judgment and expressiveness, as well as knowledge and skills." The Course of Study advocates that in addition to acquiring the basic fundamental knowledge and skills in each subject, students also need to take part in learning activities that apply knowledge and skills in order to nurture reflection, judgment, and expressiveness, and that inquiry-based activities focused on comprehensive learning need to be handled in a mutually relevant manner (General Guide to the Ministry of Education, Culture, Sports, Science and Technology Elementary School Course of Study, 2008). "Solid academic capabilities" are defined as "the

ability to master and apply knowledge and to be able to respond actively to and solve various issues by thinking, judging, and expressing oneself" (http://www.mext.go.jp/a_menu/shotou/new-cs/idea/index.htm). Based on this definition, the ability in "metacognition" mentioned in this paper is more or less synonymous with these "solid academic capabilities." Of course, there are differences between the two on closer examination.

3. According to Wiggins et al., "backward design" is "an approach to designing a curriculum or unit that begins with the end in mind and designs toward that end" (Wiggins & McTighe, 2005, 338).
4. Figure 4 is based on an extensive modification by the author of the following work: Cornu, A. L. (2009). "Meaning, Internalization, and Externalization: Toward a Fuller Understanding of the Process of Reflection and Its Role in the Construction of the Self." *Adult Education Quarterly*, 59 (4), 294.
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